

ii) cooling the heated solid titaniferous material and liquid oxide phase to form a solidified material comprising a titaniferous phase and an impurity containing phase that is leachable in an acid or alkaline leachant; and

iii) leaching the solidified material with an acid leachant or an alkaline leachant to leach at least a portion of said impurities.

26. A process according to Claim 25, wherein additive is present in an amount of about 1% by weight of the titaniferous material.

27. A process according to Claim 25, wherein the additive is present in an amount such that the liquid oxide phase does not exceed about 15% by volume of the titaniferous material.--

REMARKS

Applicants' attorney is appreciative of the interview conducted by the Examiner on September 15, 1997. At that interview, a proposed amendment to Claim 17 was presented, and the differences between the invention and the cited art were discussed.

Claims 3 through 24 have been rejected under 35 USC § 112, first paragraph, as containing subject matter not described in the specification.

In Claim 17, the phrase "or a sequential combination of an acid and an alkaline leachant" is alleged to be new matter, and this phrase has now been removed from the claim.

Claims 20 and 22 have also been objected to as containing new matter.

Claim 20 recites a process in which an alkaline leached solidified material is leached with an acid leachant. Such a leaching sequence is specifically described in the specification, for example in Example 2, where roasted pellets were initially caustic leached under reflux in a 10% NaOH solution, which is clearly alkaline, and subsequently leached in 15% HCl, which is clearly an acid leach.

Claim 22 recites a process where the titaniferous material is heated to a temperature of at least 1000°C. Claim 22 has now been cancelled and the subject matter of Claim 22 incorporated into Claim 17 which now recites a temperature range of about 1000°C to less than 1300°C.

Claim 1 as originally filed in this application recited a temperature for this heating step of less than 1300°C, while Examples 1 and 2 of the application both recite

heating to about 1000°C. According to long established decisional law, the disclosure of a broad range (less than 1300°C) and a particular value within the range (1000°C) provides specific support for a new range bounded by the disclosed values. Accordingly, a range of about 1000°C to less than 1300°C is clearly supported.

Withdrawal of this rejection is accordingly requested.

Claim 16 has been rejected under 35 USC § 112, second paragraph, as being indefinite and depending on cancelled Claim 1, and Claim 16 has now been amended to depend from Claim 17. Withdrawal of this rejection is accordingly requested.

Claims 3 through 24 have been rejected under 35 USC § 103(a) over Heikel '916 or France '777 or Leary '438 or Pollard '934 or Stewart '099 or Stewart '929, each optionally in view of Chao '837. Applicants submit that the presently claimed invention is patentable over the cited combination of references.

Claim 17 has now been amended to recite that the heating step takes place under reducing conditions and at a temperature of about 1000°C to less than 1300°C. The heating step takes place in the presence of an additive which promotes

formation of a liquid oxide phase containing the impurities and concurrently, a solid titaniferous phase. The heated material is cooled, the liquid oxide phase forming a solidified material comprising a titaniferous phase and an impurity containing phase that is leachable in an acid or alkaline leachant. Solidified material is then leached with an acid leachant or an alkaline leachant to leach at least a portion of said impurities.

The Heikel reference discloses a process for preparing pigmentary titanium dioxide in which a roasting step is carried out under oxidizing conditions, as disclosed for example, at column 5, lines 22-23. At column 3, lines 42-44, Heikel discloses that during the roasting step in the preferred embodiment the titanium dioxide reacts with sodium hydroxide to form sodium titanate. Sodium titanate is extremely difficult to leach and the undesirability of such titanates is disclosed in the paragraph beginning at line 9 on page 9 of the present application. The difficulty of leaching titanates is reflected by the extreme digestion conditions used by Heikel.

France '777 discloses a process in which a titaniferous material is heated at a temperature in the range of 1300 to 1700°C under conditions which form a molten slag

containing titanium dioxide and other oxides and molten iron. The molten slag and molten metal are then separated and allowed to cool, and the molten slag is leached in acid.

The French patent discloses only heating a titaniferous material at a temperature greater than 1300°C, whereas the presently claimed invention uses temperatures of less than 1300°C. Moreover, the presently claimed invention forms a solid titaniferous phase, whereas there is no solid titaniferous phase retained under the heating conditions of the French patent. Indeed, the objective of the French patent is not to retain a solid titaniferous phase and the patent clearly discloses that the slag, i.e. the titaniferous phase is molten; see the paragraph bridging pages 5 and 6.

The Leary patent discloses a process in which titanium and iron compounds are mixed with a flux and heated to a temperature within the range of 350 to 650°C. Under these conditions, the titanium values dissolve in the flux, which is molten, while the iron forms a solid alkali metal ferrate compound dispersed in the flux. There is no disclosure or suggestion in the Leary patent that the titaniferous material should be heated in the presence of an additive which promotes the formation of a liquid oxide phase containing impurities and a solid titaniferous phase.

Claim 17 has now been amended to recite a temperature range of about 1000°C to less than 1300°C in order to clearly distinguish over the process of Leary. Moreover, it is clear that to carry out the process of Leary would not fall within the presently claimed invention, since the titaniferous material would be present in the liquid flux phase rather than in a solid phase dispersed in a liquid oxide phase.

Applicants note that the presently claimed distribution of titaniferous and impurity material may be a result of the amounts of titaniferous material and liquid oxide material which are mixed together. Accordingly, applicants have now added a new Claim 25 to the application that recites that the heating step takes place in the presence of an amount of an additive which promotes formation of a liquid oxide phase containing the impurities of the temperature at heating, to produce thereby a solid titaniferous phase and a liquid oxide phase containing the impurities. Claim 26 recites that the additive is present in an amount of about 1% by weight of the titaniferous material, as disclosed in Example 2 of the specification (1.1% by weight) and Claim 27 recites that the additive is present in an amount such that the liquid oxide phase does not exceed

about 15% by volume of the titaniferous material, as disclosed in the present specification at page 10, lines 21-27.

The Pollard et al reference and the Stewart et al references all disclose heating a titaniferous material in the presence of a flux which is a chloride. According to these references, alkali metal chlorides and alkaline earth metal chlorides are used. The materials used by Pollard and Stewart et al are not additives which promote the formation of a liquid oxide phase according to the presently claimed invention; those materials, as can be seen from the present examples, are oxides, hydroxides, borates and silicates, otherwise thought of as "glass formers." Thus, the Pollard et al and Stewart et al references do not disclose heating a titaniferous material with an additive which promotes the formation of a liquid oxide phase.

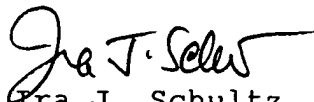
The Chao et al reference discloses subjecting a TiO_2 -containing ore to two or more leaching treatments. While sequential leaching treatments may be known, Chao et al does nothing to cure the defects of the primary references discussed above.

Accordingly, the references taken individually or in combination do not disclose or suggest heating a titaniferous material under reducing conditions in the presence of an

additive which promotes the formation of a liquid oxide phase containing the impurities present in the titaniferous material, forming thereby a solid titaniferous phase and a liquid oxide phase containing impurities, cooling the solid material and liquid phase to form a solidified material, and leaching the solidified material to at least a portion of the impurities. Accordingly, withdrawal of this rejection is requested.

In view of the foregoing amendments and remarks, Applicants submit that the present application is now in condition for allowance. An early allowance of the application with amended claims is earnestly solicited.

Respectfully submitted,



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